

REMARKS

The above amendment is submitted to include the cross-referencing of the PCT application.

New claims 9-16 were added.

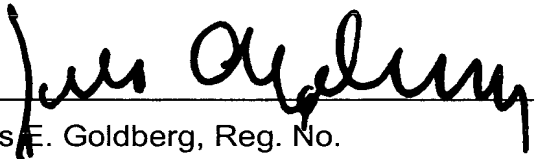
Substitute pages 4 – 11/1, 44-46/1 of the specification and a new Abstract and marked up versions are also enclosed.

Entry of the application is earnestly solicited.

Respectfully submitted,

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resilient force of the first resilient body, thereby causing another problem that the weight of the device is increased than required.

It is therefore an object of the present invention to provide a dismounting device for a heavy load hoisting sling capable of ensuring a strength corresponding to a weight of a heavy load upon hoisting the same, thereby requiring only a minimally increased size of the device.

It is another object of the present invention to provide a dismounting device for a heavy load hoisting sling capable of assuredly preventing distal ends of link levers from being released from distal ends of lever holders when a heavy load is hoisted, and capable of allowing the slings to be readily and quickly dismounted from the heavy load when the heavy load is downed at a predetermined place.

DISCLOSURE OF THE INVENTION

As shown in FIG. 1 and FIG. 4, the invention according to Claim 1 is an improvement of a dismounting device for a heavy load hoisting sling, comprising:

a base 16 including at its upper end a crane engagement portion 27 to be engaged with a hook 26a of a crane 26 or with a hook block;

a lever holder 17 pivotally connected at a substantial center thereof to a first shaft 11 affixed to the base 16 below the crane engagement portion 27;

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a link lever 18 including a proximal end swingably mounted on a second shaft 12 affixed to the base 16 below the first shaft 11, and a distal end to be engaged with a distal end of the lever holder 17, in which one end of a sling 13 including the other end to be hung on the hook of the crane or on the base 16 so as to be engageable with a heavy load 14, is releasably hung on the link lever 18; and

releasing means 19 for lowering a proximal end of the lever holder 17 to raise the distal end of the lever holder 17, thereby releasing the distal end of the link lever 18 from the distal end of the lever holder 17.

The characterizing configuration thereof resides in that the releasing means 19 comprises a slider 31 vertically movably provided on the base 16 to engage with the proximal end of the lever holder 17, thereby urging the proximal end of the lever holder 17 in a direction to push down the same; that the slider 31 includes an ascending/descending rod 31a and an engagement plate 31b which is integrally provided at an upper portion of the ascending/descending rod 31a and which extends horizontally or is inclined; and that the engagement plate 31b is configured to engage with the proximal end of the lever holder 17.

In the dismantling device for a heavy load hoisting sling recited in Claim 1, the hook 26a of the crane 26 is firstly engaged with the crane engagement portion 27, and the one end of the sling 13 is hung on the hook of the crane or on the base 16. Next, the base 16 is placed just above the heavy

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load 14, the sling 13 is engaged with the heavy load 14 and the other end of the sling 13 is hung on the link lever 18, and then the distal end of the link lever is engaged with the distal end of the lever holder 17. When the heavy load 14 is hoisted by the crane 26, a relatively larger force by rotation moment based on a weight of the heavy load 14 is outwardly applied to the distal end of the link lever 18, i.e., applied in a direction to press the distal end of the link lever 18 against the distal end of the lever holder 17, so that a frictional force between the distal end of the link lever 18 and the distal end of the lever holder 17 is increased, thereby maintaining a state where the distal end of the link lever is engaged with the distal end of the lever holder. Next, when the heavy load 14 is downed at a predetermined place in a state where the slider 31 of the releasing means 19 is lowered and the engagement plate 31b is engaged with the proximal end of the lever holder 17 to thereby cause the self-weight of the slider 31 to act thereon, the sling 13 is relaxed and the force acted on the distal end of the link lever 18 is removed, so that the distal end of the link lever 18 can be readily released from the distal end of the lever holder 17 by virtue of the self-weight of the slider 31. As the distal end of the link lever is released from the distal end of the lever holder, the distal end of the link lever 18 is downwardly turned. When the base 16 is lifted by the crane 26 in this state, the other end of the sling 13 is released from the

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link lever 18 and then the sling 13 is released from the heavy load 14 so that the sling 13 is lifted together with the base 16.

As shown in FIG. 7 and FIG. 8, the invention of Claim 2 according to Claim 1 is characterized in

that the link lever 18 includes: a proximal end portion 18a swingably mounted on the second shaft 12; a curved portion 18b provided continuously to the proximal end portion 18a and curved at a predetermined curvature radius; a distal end portion 18c engageable with the distal end of the lever holder 17; and a beam portion 18d connecting the curved portion 18b and the distal end portion 18c with each other; and

that, when assuming:

a limit point of action P which is a position where the other end of the sling 13 contacts with the link lever 18, when the link lever 18 is turned about the second shaft 12 so that the beam portion 18d is brought from an upright posture to a horizontal posture, by releasing the link lever 18 from the lever holder 17, from a state where the other end of the sling 13 engaged with the heavy load 14 is hung on the link lever 18 and the distal end of the link lever 18 is engaged with the distal end of the lever holder 17;

an angle α which is defined between: a straight line L connecting a central point of the second shaft 12 to the limit point of action P; and an inside line of the beam

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portion 18d; and

an angle β which is defined between: a straight line M connecting a central point of the second shaft 12 to the center of gravity G of the link lever 18; and an inside line of the beam portion 18d;

one or each of the angle α and angle β is configured to be an obtuse angle.

In the dismounting device for a heavy load hoisting sling recited in Claim 2, when the angle α defined between the straight line L connecting the central point of the second shaft 12 to the limit point of action P and the inside line of the beam portion 18d, is an obtuse angle in case that the weight of the heavy load 14 is extremely larger than the self-weight of the link lever 18 and in case that the link lever 18 is released from the lever holder 17 and the base 16 is lifted so that the beam portion 18d is brought from an upright posture to a horizontal posture, the link lever 18 is turned in a direction to further transfer from the horizontal posture to a downward posture so that the other end of the sling 13 is released from the link lever 18. Further, when the angle β defined between the straight line M connecting the central point of the second shaft 12 to a center of gravity G of the link lever 18, and the inside line of the beam portion 18d, is an obtuse angle in case that the weight of the heavy load 14 is relatively small so that the self-weight of the link lever 18 affects a rotation moment

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thereof and in case that the link lever 18 is released from the lever holder 17 and the base 16 is lifted so that the beam portion 18d is brought from an upright posture to a horizontal posture, the link lever 18 is turned in a direction to further transfer from the horizontal posture to a downward posture so that the other end of the sling 13 is released from the link lever 18.

As shown in FIG. 1 and FIG. 4, the invention of Claim 3 according to Claim 1 is characterized in

that the releasing means 19 comprises, in addition to the slider 31, :

locking means 32 provided on the base 16 and engaged with the slider 31 to thereby temporarily lock the slider 31 in a raised state; and

unlocking means 33 for unlocking the temporarily locked slider 31;

that when the weight of the heavy load 14 is applied to the link lever 18 through the sling 13, there is maintained a state where the distal end of the link lever 18 is engaged with the distal end of the lever holder 17; and

that the slider 31 is configured to raise the distal end of the lever holder 17 to thereby release the distal end of the link lever 18 from the distal end of the lever holder 17 when the temporarily locked slider 31 is unlocked by the unlocking means 33 and the weight of the heavy load 14 is not applied to the link lever 18 through the sling 13.

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In the dismounting device for a heavy load hoisting sling recited in Claim 3, the hook 26a of the crane 26 is firstly engaged with the crane engagement portion 27, and the one end of the sling 13 is hung on the hook of the crane or on the base 16. In this state, as the base 16 is placed just above the heavy load 14 and the slider 31 is raised, the locking means 32 temporarily locks the slider 31 in the raised state, so that the self-weight of the slider 31 is not applied to the proximal end of the lever holder 17 thereby lowering the distal end of the lever holder 17. Next, the sling 13 is engaged with the heavy load 14, the other end of the sling is hung on the link lever 18, and the distal end of the link lever 18 is engaged with the distal end of the lever holder 17. In this state, when the heavy load 14 is hoisted by the crane 26, there is maintained the state where the distal end of the link lever 18 is engaged with the distal end of the lever holder 17 identically to Claim 1. Next, when the heavy load 14 is downed at a predetermined place, the sling 13 is relaxed and the force acted on the distal end of the link lever 18 is removed. In this state, when the locked slider 31 is unlocked by the unlocking means 33, the slider 31 is lowered and the proximal end of the lever holder 17 is pushed down by the self-weight of the slider 31, so that the distal end of the lever holder is raised and the distal end of the link lever 18 is released from the lever holder 17 to thereby downwardly turn the distal end of the link

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lever. Further, when the base 16 is lifted by the crane 26, the other end of the sling 13 is released from the link lever 18 and then the sling 13 is released from the heavy load 14 so that the sling 13 is lifted together with the base 16.

As shown in FIG. 1, FIG. 4, and FIG. 9, the invention of Claim 4 according to Claim 3 is characterized in that the base 16 includes: a first plate 21 and a second plate 22 both extending vertically; and a fixing plate 24 provided between the first plate 21 and the second plate 22, to horizontally extend or to be inclined, to thereby couple the first plate 21 to the second plate 22, the fixing plate 24 being formed with a through-hole 24a;

that the ascending/descending rod 31a of the slider 31 is loosely inserted through the through-hole 24a;

that when the weight of the heavy load 14 is applied to the link lever 18 through the sling 13, there is maintained a state where the distal end of the link lever 18 is engaged with the distal end of the lever holder 17; and

that the engagement plate 31b is configured to raise the distal end of the lever holder 17 by self-weights of at least the ascending/descending rod 31a and the engagement plate 31b itself to thereby release the distal end of the link lever 18 from the distal end of the lever holder 17 when the weight of the heavy load 14 is not applied to the link lever 18 through the sling 13.

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In the dismounting device for a heavy load hoisting sling recited in Claim 4, the hook 26a of the crane 26 is firstly engaged with the crane engagement portion 27, and the one end of the sling 13 is hung on the hook of the crane or on the base 16. In this state, as the base 16 is placed just above the heavy load 14 and the slider 31 is raised, the locking means 33 temporarily locks the

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Examples of structures for slidably and swingably mount the proximal end of each lever holder to the end of the engagement plate, include a structure having: an elongated hole formed in and longitudinally extending along the proximal end of the lever holder or the end portion of the engagement plate; and a pin protruded at the end portion of the engagement plate or the proximal end of the lever holder, so as to engage with the elongated hole.

According to the present invention as described above, each lever holder is swingably mounted on the base through the associated first shaft,

the proximal end of each link lever having the distal end engageable with the distal end of the associated lever holder, is swingably mounted on the base through the associated second shaft,

the releasing means is configured to lower the proximal end of each lever holder,

the releasing means includes the slider, which is vertically movably provided on the base, and which engages with the proximal end of each lever holder to thereby urge the same in the direction to push down the proximal end of the lever holder,

the slider includes the ascending/descending rod, and the engagement plate which is provided integrally with the ascending/descending rod at the upper portion of the ascending/descending rod and which extends horizontally or is inclined, and

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the engagement plate is configured to engage with the proximal end of each lever holder. Thus, there is kept a state where the distal end of each link lever is engaged with the distal end of the associated lever holder when a weight of a heavy load is applied to the link lever, while the distal end of each lever holder is raised by the releasing means when no weight is applied to each link lever so that the distal end of the link lever is released from the distal end of the associated lever holder. As a result, the heavy load can be assuredly held once the heavy load is hoisted. Further, when the slider of the releasing means is lowered and the engagement plate is engaged with the proximal end of each lever holder to thereby allow the self-weight of the slider to act in a state where the heavy load is previously hoisted, the other end of each sling is released from the associated link lever so that the sling can be rapidly dismantled from the heavy load when the heavy load is downed at a predetermined place. Moreover, as compared with conventional dismantling devices which have been large-sized than required correspondingly to sizes of rings of bottom wires in case of hoisting a heavier load, it is enough for the dismantling device according to the present invention to be large-sized at a required minimum extent to ensure a strength corresponding to a weight of a heavier load even in case of hoisting the heavier load.

Further, if the angle α is an obtuse angle when a

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weight of a heavy load is extremely larger than the self-weight of the link lever(s), the beam portion of the link lever is turned in a direction to further transfer from a horizontal posture to a downward posture, so that other ends of slings are released from the link lever. In turn, if the angle β is an obtuse angle when a weight of a heavy load is relatively small so that the self-weight of the link lever(s) affects a rotation moment thereof, the beam portion of the link lever is turned in a direction to further transfer from a horizontal posture to a downward posture, so that other ends of slings are released from the link lever.

The slider of the releasing means is vertically movably provided on the base, the locking means for temporarily locking the slider in a raised state is provided on the base, and the unlocking means is configured to unlock the temporarily locked slider. This maintains a state where the distal end of each link lever is engaged with the distal end of the associated lever holder, when a weight of a heavy load is applied to the link lever through the slings. Further, when the temporarily locked slider is unlocked by the unlocking means and the weight of the heavy load is not applied to each link lever through the slings, the distal end of the lever holder is raised by the slider so that the distal end of each link lever is released from the distal end of the lever holder. As a result, in hoisting a heavy load, the heavy load can be assuredly held,

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and slings can be automatically dismounted from a heavy load when the heavy load is downed at a predetermined place, by unlocking the temporarily locked slider by the unlocking means in a state where the heavy load is previously hoisted. Further, when the ascending/descending rod of the slider is configured to be movably inserted to the through hole of the fixing plate of the base and the engaging plate provided on the upper part of the ascending/descending rod is configured to be engageable with the proximal end of the lever holder, there is maintained a state where the distal end of each link lever is engaged with the distal end of the associated lever holder when the weight of the heavy load is applied to the link lever through the slings, and the engagement plate raises the distal end of each lever holder by self-weights of the ascending/descending rod and engagement plate itself to thereby release the distal end of each link lever from the distal end of the associated lever holder when the weight of the heavy load is not

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ABSTRACT

A base 16—has at its upper end a crane engagement portion 27—with which a hook of a crane is engaged. Pivotally engaged with a first shaft 11 affixed to the base below the crane engagement portion, is a substantial center of a lever holder 17. Swingably mounted on a second shaft 12 affixed to the base below the first shaft is a proximal end of a link lever 18, and this link lever has a distal end releasably engaged with a distal end of the lever holder. One end of a sling 13 including the other end to be hung on the hook of the crane so as to be engageable with a heavy load, is releasably hung on the link lever. Further, releasing means 19 lowers a proximal end of the lever holder to thereby release the distal end of the link lever from the distal end of the lever holder.

In hoisting a heavy load, it is enough to attain a required minimum of size increase of a dismounting device for a heavy load hoisting sling, so as to ensure a strength corresponding to a weight of the heavy load.